markable finish and value. The object is then heated, enamelled, and baked.

It is different with the decoration accomplished by means of a muffle oven; in this method the painting is always made on baked porcelain, and consequently on enamel, and the heat employed is relatively low. In this process there is necessary, in order to make the colours on the metals adhere, a medium, which is called the *fondant;* it is generally a silicate, or silico-borate of lead. By raising the temperature, these bodies are fused, attack the object, combine with it, and at the same time determine by that reaction the adhesion of the colour. According to the nature of the *fondants* and colours, a greater or less heat may be applied; and as certain colours are more sensitive than others, it is frequently necessary to bake at successive fires of different temperatures. The baking of colours by this process requires very great experience; the absence of any instruments of precision is greatly felt, and there is no other means of ascertaining the temperature that prevails in the muffle, than to observe on samples of porcelain the changes of colour which are undergone by certain preparations very sensitive to differences of temperatures.

PHYLLOXERA

DR. MARION has recently published (Dupont, Paris, 1882) a *résumé* of the results attending the efforts of the Paris, Lyons, and Mediterranean Railway Company to stay the ravages of phylloxera. These efforts were inaugurated in 1876 at a time when the wine growers of Hérault were on the point of relinquishing the struggle. Dumas having demonstrated the great value of alkaline sulphocarbonates as insecticides, this company energetically planned and organised its distribution, with such success that in the period between 1877 and 1881 the number of barrels distributed through their agency rose from 1085 to 14149. The sulphocarbonate is injected twice a year in doses of 12 grammes into holes half a metre apart, being either administered in simple doses or double doses, with an interval of three or four days. The doses vary, however somewhat, according to the nature of the soil and condition of the vines, and much is therefore left to the intelligence of the operator. The remedy acts imperfectly in clayey or stiff soils, and when the ground is saturated.

The first injury manifested when vines are attacked is the loss of their finer radicles, which perish through the suction of the aphid. The consequent loss of nutrition next causes the partial death of old wood and feebleness in the young shoots, followed by a gradual diminution in the fruit. If badly attacked, old vines cannot be saved, as much of the woody stem is dead beyond recovery, but young vines almost always recover under the sulphocarbon treatment, when applied under favourable conditions; new radicles appear, then an increasing luxuriance in the foliary organs, and finally the renewed production of fruit. Dr. Marion strongly advocates the use of this remedy, and sustains his arguments by well selected examples which thoroughly demonstrate its efficacy. It is capable of a wide application, the prices realised for wines in most districts being well able to support its cost.

Other remedies found practicable, but not discussed in Dr. Marion's work, are submersion, and replacement by American stock, with or without grafting. The former can only be practised in comparatively flat or low-lying vineyards in proximity to rivers or canals. These are surrounded by strong embankments of from one to one and a half metres high; and the waters are either let in by mere difference of level at flood times or by centrifugal pumps. The water must not be less than 40 to 50 centimetres in depth, and remain forty to fifty days, and the process is repeated each year. Some waters help to fertilise the soil, and this treatment has invariably produced the best results.

The introduction of American vines has also in certain districts been attended with great success, both in clayey soils, and where the smallness of the vintage per acre precludes the sustained use of costly remedies. The species, however, possess most varying powers of resistance in different soils, and require to be selected with great care. In the vineyards of Medoc, and of high-class vines generally, American stocks are only used for grafting, a clever workman being able to operate on 100 to 200 vines per diem, 70 to 90 per cent. of which will be successful.

Among partly successful remedies may be mentioned the system *Garros*. This consists in uncovering the roots of the vines as far as possible, and treating them with a litre of powdered quicklime, sulphate of copper, and sea-salt. The remedy has been found efficacious, but seems to act, not fatally, on the insects, but in diminishing their number and stimulating the plants to overcome their ravages. The system *Sabaté* is directed towards the destruction of the winter egg, which produces the winged or reproducing stage of the phylloxera. The treatment consists in removing the dead bark from the trunk, and dusting with powdered quicklime, but, like the last, it is not fatal to the insect. A third remedy, that of *Dunay*, consists in exposing the roots of the vine, and coating them from the surface-roots to some 20 centimetres in depth with coal-tar.

I saw, while staying with Leland Cossart, in Madeira, a plan somewhat similar to this practised with great success. Mr. John Leacock, its inventor, removes after the first autumn rain, the soil to a depth of some 20 inches, so as to expose the upper roots, peels off the loose bark and paints the roots with resin dissolved in turpentine, at the same time manuring the vines. This mixture being unaffected by water remains viscid for three or four years, and destroys the insects on their passage up and down. Its cost is less than a halfpenny per vine, and while those so treated were luxuriant in bright green foliage, all around were yellowing and weak.

J. S. GARDNER

THE EXTENSION SEAWARD OF THE WATERS OF THE CHINESE RIVERS

THE following notes, on the extension seaward of the waters of the Yang-tse, were made in the months of September and October (1878), a period of the year when the river first commences to fall, after its waters have attained their maximum height. The four points to which I turned my attention were—the colour and general appearance of the water, the taste, the specific gravity, and the relative amount of chlorides in solution. Owing to the powerful revolving tides of the estuary of the Yang-tse, the river-water and sea-water are churned up together in such a manner that the patches of green and yellow water may be plainly observed, and their line of union as sharply defined. It is from this cause that the density of the water may fluctuate to a very marked degree in the limit of a single mile; and it was not an uncommon experience, on passing from a patch of yellow water into one of green colour, to observe a sudden increase in the density from 1·005 to 1·015. The specific gravity is never constant in the same locality; and it is only by taking all the four points into consideration that a reliable inference could be drawn: thus, the first evidence of the proximity of salt water, which was found at a distance varying from fifteen to thirty miles from Wusung, was not afforded by any marked increase of the density or by any alteration in the taste or colour of the water, but merely by a very perceptible increase in the amount of chlorides held in solution; whilst in the midst of the islands of the Chusan archipelago, which are removed

about a hundred miles to the southward, it was often necessary to depend more on the density of the water, on account of the subsidence of the sediment.

Without entering into the details it may be sufficent to state that, whilst the waters of the Yang-tse, according to my observations, became permanently free from sediment, and assumed the more marked characters of sea-water, with a minimum density of 1·018, at a distance of about forty miles east of Wusung, they still retained their yellow colour and turbid appearance, with a density varying between 1·005 and 1·011, on the outskirts of the Chusan archipelago, about a hundred miles to the southward. From these data the conclusion may very naturally be drawn that the main body of the water discharged by the Yang-tse flows comparatively undisturbed in a southerly direction across the Hang-chu Bay to the Chusan archipelago. The southerly extension of the muddy waters of the Yang-tse in the neighbourhood of Chusan[1] must have been a frequent subject of remark to any one approaching Shanghai from the southward, and should he at some subsequent period undertake the voyage from that port to Nagasaki, he will be very probably surprised to find himself, some four or five hours after leaving Wusung, surrounded by the green waters of the Eastern Sea. The situation of the Great Yang-tse bank, which extends one hundred and fifty miles to the north-east from the mouth of the river, would appear to negative the conclusion at which I have arrived; but I am inclined to view this bank—lying as it does rather off the entrances to the river, and composed as it is of fine grey sand—as rather the work of a past period, when perhaps the bulk of the waters found a passage to the north of the island of Tsung-ming, than as being in actual formation at present. That a vast amount of sediment is deposited to the southward of the estuary at the present time we have the most undoubted testimony in the rapid shoaling of the sea amongst the islands of the Chusan archipelago, and along the shores of the Hang-chu Bay, which has caused channels at one time navigable for junks to be now impassable.

With reference to the general effect of the water discharged by the Chinese rivers on the density of the Yellow Sea and of the Gulf of Pe-chili, I may observe that in the month of October I found the specific gravity to rise slowly from 1·019 at the base of the Great Yang-tse bank—a point between fifty and sixty miles east of Wusung—to 1·023 amongst the islands of the Corean archipelago; and that the maximum of 1·024 was attained at a point mid-way between this archipelago and the Shantung promontary. North of this cape the density does not vary in any marked degree, but after the Miau-tau Islands were passed—a group which separates the Gulf of Pe-chili from the Yellow Sea—there was a gradual diminution, until, at our nearest point of approach to the Yellow River, the mouth of which was forty-five miles distant, the specific gravity was 1·021. This slight fall in the density was the *only indication* of our proximity to such a large river as the Hoang-ho—a circumstance which has a particular bearing on the excessive amount of sediment which this river has been estimated to discharge (*vide* NATURE, vol. xxii. p. 487). From this point to the mouth of the Pei-ho the specific gravity continued to decrease, until at a point about twenty-three miles from the mouth of this river, where the discolouration from sediment was first observed, it was 1·020. Thence to the Taku forts the density rapidly fell.

We may thus place the specific gravity of the Gulf of Pe-chili at from 1·020 to 1·023, and that of the Yellow Sea at from 1·022 to 1·024, whilst the difference between these densities and that of oceanic water—1·027—will represent the combined effect of the discharge of the Pei-ho, the Yellow River, and to a less degree of the Yang-tse, on the specific gravities of the seas in question.

I must conclude with an observation on the erroneous notion which the appellation of "Yellow Sea" must convey to the minds of most men. For however much the Yellow Sea may have merited the epithet of "yellow" when it received the waters of the Hoang-ho about a quarter of a century ago—though if an inference is to be drawn from the present condition of the Gulf of Pe-chili it could scarcely have been entitled to it even at that period—it has no claim whatever to it now. Free from sediment and dark green in colour, except in the immediate vicinity of the estuary of the Yang-tse, the Yellow Sea has been more appropriately named by Chinese sailors—"The Black-water Ocean." H. B. GUPPY

H.M.S. *Lark*, Sydney

[1] I may take this opportunity of observing, that on one occasion when off the northern extremity of Chusan, I noticed several large medusæ floating on the surface of the water, which was not only muddy in appearance but had a density of 1·006.

PROFESSOR GEIKIE IN ARRAN

AMONG the many features which have lent attraction to the study of geology at Edinburgh University, Prof. Geikie's field demonstrations have always held a conspicuous place. Few favourable Saturdays have been allowed to pass, on which he might not be seen rambling with his class through some wooded glen, or climbing some rugged brae, with hammer, sketch-book, and map-case, and every now and then stopping to point out some striking rock section, or to examine a "find," made perchance by one of his students. But at the end of the session, when a week or ten days are devoted to the exploration of some district possessing an interesting geological structure, the "long excursion" is always looked forward to with the keenest delight by professor as well as by students. The first long class-excursion ten years ago was to Arran, and the Professor decided that his last should also be to that island—famous alike for the beauty of its scenery and for the interest attaching to its geological framework. Quarters were taken up at Corrie Hotel on Monday April 24, and that afternoon saw the whole party, numbering about a score, roaming with bags and hammers along the coast towards North Glen Sannox, and making the acquaintance of the coarse red sandstones and brecciated white quartz conglomerates of the Upper Old Red, or Lower Calciferous Sandstone series, which extend in a broad belt round that part of the island. Further inland, a coarse conglomerate made up of well-rounded pebbles of pinkish quartz interstratified with characteristic dark chocolate-coloured sandstones and occasional argillaceous beds, was ascertained some years ago by the Professor to belong to the Lower Old Red Sandstone, and to be brought down by a fault against the schists that fringe the mountainous granitic core of the northern half of the island. He had already made some progress with a geological map of the island on a scale of six inches to a mile, and he now purposes to continue this work with the co-operation of his students. Resuming his geological boundary-lines at Glen Sannox, the party was soon scouring the hillsides far and near, in search of rock-sections and exposures, while he, map in hand, remained within ear-shot, and superintended operations, marking down the lines of junction, and unravelling the geological structures with the skilful hand of one long acquainted with the art of geological mapping. In this way several miles of the boundary between the granite and schists were mapped. In the course of a walk along the steep craggy Suidhe Fearghus, on the north side of Glen Sannox, the trend of this remarkable ridge was found to coincide with that of the vertical joint in the granite, and the deep gashes which indent its profile were observed to be due sometimes to cross joints, sometimes to basalt dykes which, decomposing, have weathered down much faster than the surrounding granite. The view from Caisteal Abhail, the highest peak (2735 feet) of the ridge, was magnificent, extending